

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 1, 3-14, 18 and 19 are in this Application. Claims 1 and 3-15 have been rejected. Claims 2, 16 and 16 have been canceled in a previous response. Claim 15 has been canceled herewith. Claims 1 and 3 have been amended herewith. New claims 18 and 19 have been added herewith.

A Declaration under 37 CFR 1.132 from Professor Izhak BUCHER is being submitted together with this amendment, and the Examiner is requested to enter the same.

35 U.S.C. § 112 Rejections

Claims 1 and 15 stand rejected under 35 U.S.C. § 112, second paragraph. The Examiner objects to the term "said geometric waveform." This term has been replaced with "a geometric waveform," thereby rendering the objection moot. The Examiner further states that the claims are unclear because "a geometric waveform" is a result/consequence of an oscillating of an oscillator, and the claims seem to claim the value of inputs dependent on the value of outputs. The Examiner states that it is a reverse engineering.

The Examiner's rejection is respectfully traversed.

It is firstly noted that there is nothing in the statutory requirement (or the MPEP) that relates to a reverse engineering, and the Examiner's statement in this respect is at least not clear. Reverse engineering is a process in which a person determines what are the components and operational principles of a product after the product has been made. If the Examiner objects to the definition of the mass values and stiffness coefficients in terms of the resulting waveform, then this is not reverse engineering, but rather a clear definition of parameters, and is certainly within the statutory requirement of 35 U.S.C. § 112.

It is submitted that the claims are not indefinite. The claims define an oscillator with a light processing module and additional masses coupled to each other

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

via elastic elements, thus forming altogether a system of coupled oscillators characterized by n eigenvectors and n eigenvalues. The system is driven by a periodic force characterized by a fundamental frequency ω_0 . For a given mass value of the light processing module, the mass values of the additional masses, and the stiffness coefficients of the elastic elements, are selected such that (i) each of the eigenvalues is an integer multiplication of ω_0 , and (ii) at least one of the eigenvectors corresponds to oscillation of the light processing module according to a geometric-waveform.

It is submitted that and the skilled person would know when a particular oscillator falls under the limitation of the claims, since there is a well-defined and solvable relation between the mass values of the masses, the stiffness coefficients, and the fundamental frequency, such that, given the fundamental frequency and the mass value of the light processing module, each of the other mass values and each of the stiffness coefficients can be determined. To this end, the Examiner is referred, for example, to paragraphs 23 and 30 of the published version of the specification (U.S. Published Application No. 20070139750), which demonstrate that such relation indeed exists and is solvable.

Thus, the claims are definite since the mass values of the additional masses and the stiffness coefficients are properly defined in terms of the given mass value of the light processing module and the given fundamental frequency ω_0 . Withdrawal of the 112 rejection is, therefore, respectfully requested.

35 U.S.C. § 103 Rejections

Claims 1 and 3-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Elsner in view of Frenk, claim 3 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Elsner in view of Frenk and further in view of Hagelin, and claim 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Elsner in view of Shahoian.

Regarding claim 3, it is noted that the PTO has acknowledged that neither Elsner nor Frenk discloses the feature of this claim (Office Action at 8). Therefore,

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

the 103 rejection of this claim over the combination of Elsner and Frenk (Office Action at 7) is improper, and the Examiner is kindly requested to withdraw this rejection.

In order to keep the response concise, the following remarks are all related to the independent claim, which is claim 1. The dependent claims are submitted to be patentable at least by virtue of their dependency on their parent claims.

The Examiner identifies in Elsner the masses, the light processing module, the force producing element and the elastic elements. The Examiner is understood to assert for that any predetermined mass value, any predetermined force value, and any predetermined stiffness coefficient value, the light processing module will oscillate according to any predetermined waveform. The Examiner acknowledges that Elsner lacks teachings of triangular, non-sinusoidal, and square waveform, but cites Frenk and states that Frenk teaches a symmetrically mass system oscillator for generating non-sinusoidal or triangular movements. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time invention was made to incorporate the teachings of Frenk into the device of Elsner for purpose of generating symmetric waveform.

Applicants respectfully traverse the Examiner's rejection. Firstly, it is not correct that for any predetermined mass, force and stiffness coefficient values, the light processing module will oscillate according to any predetermined waveform. This is because the waveform depends on the parameters of the system, and if the waveform is "predetermined" then only a limited number of parameters (masses, stiffness coefficients) can provide it.

Additionally, Applicants submit that the skilled person would not be able to combine the references since (i) Frenk teaches an inoperative system, (ii) the references teach away from their combination, and (iii) there is lack of factual information how to do the combination. These remarks will now be explained in greater detail.

(i) The Frenk reference is inoperative

In re Application of: Velger et al
 Serial No.: 10/554,002
 Filed: August 18, 2006
 Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
 Group Art Unit: 2873
 Attorney Docket: 51381
 Confirmation No.: 5153

Frenk describes that the respective natural resonant frequencies of the four individual mechanical oscillators should correspond as nearly as possible to the desired overtones of the system (column 2 lines 31-36). This means that if the desired frequency is ω , the natural resonant frequencies of the individual mechanical oscillators should be ω , 2ω , 3ω and 4ω . However, coupling four mechanical oscillators with such resonant frequencies simply cannot provide a triangular waveform at a frequency ω .

It is emphasized that Frenk describes the natural resonant frequencies of the individual mechanical oscillators and not the eigenvalues of the coupled system. The eigenvalues of the coupled system, as proven by the Applicants, are considerably different from the individual resonant frequencies. This can be better understood with reference to paragraph 30 of the instant specification, which describes a non-limiting example of five individual oscillators, and provides relations between the various parameters as obtained by calculating the appropriate eigenvalues. An individual oscillator comprised of mass m and spring constant k has a resonant frequency ω that satisfies $\omega^2 = k/m$. If one extracts the ratios k_1/m_1 , k_2/m_2 and k_3/m_3 from equations 5-9, the values of $2.5\omega^2$, $7.5\omega^2$ and $6\omega^2$ are obtained, respectively. These values do not satisfy Frenk requirement, since their square roots (1.581ω , 2.739ω , 2.449ω) are not overtones. The only reasonable interpretation from this analysis is that Frenk's device is inoperative, since Frenk's conjecture that the ratio between individual frequencies is an integer violates Frenk's own requirement that the produced wave is non-sinusoidal.

Furthermore, Frenk describes that the drive means on the extreme left imparts oscillatory motion at the fundamental frequency and that the second drive means is driven at a frequency corresponding to the first requisite overtone component. Such motion, in which the first mass oscillates at the fundamental frequency and the adjacent mass oscillates at the first overtone, is impossible. It is recognized that the motion of coupled oscillators is dictated by superposition of the eigenvectors that describe the system. However, there is no eigenvector combination that can result in the motion that Frenk is describing.

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

Applicants hereby submit, by way of a Rule 132 declaration, evidence that the Frenk reference describes an inoperative system. As indicated by Prof. Bucher in the accompanying Declaration, the statements made in column 2 lines 31-43 of Frenk are incorrect since it is impossible to control the individual frequencies of intercalated oscillators where each one has a respective natural resonant frequency. Prof. Bucher cites the Inman reference (Ref. [1] in the accompanying Declaration) and states that a resonant frequency is a property of the entire system and must take into account all the masses and springs. Thus, the system described in column 2 lines 31-43 of Frenk is inoperative. It is emphasized that the entire tenor of Frenk is based on this passage, so that, essentially, there is no operative system in Frenk's disclosure.

Prof. Bucher, which is an expert in the discipline of vibration, declares that the procedure described in column 3 lines 19-49 of Frenk cannot create a system with natural frequencies that are harmonic of each other. Prof. Bucher explains that any mathematical procedure for selecting the parameters of the system, such as the masses and spring constants, must follow mathematical constraints which are dictated by the equations of motion. In this respect Prof. Bucher cites the Gladwell reference (Ref. [2] in the accompanying Declaration). Prof. Bucher has studied Frenk's disclosure and found that the procedure described by Frenk disregards the basic mathematical and physical constraints of a discrete vibrating system. In particular, Prof. Bucher found that the constraints which tie together all the masses and springs in the system, and which prevent those masses and springs from being computed individually, is disregarded by Frenk. Prof. Bucher concludes that by following such a procedure, no operative system can be designed, as the described iterative process fails to follow the mathematical constraints from step 1. Prof. Bucher states that Frenk's procedure cannot lead to a system that provides non-sinusoidal vibration, in the sense that the natural resonances are integral multiples of each other.

Prof. Bucher additionally indicates that Frenk's statement according to which "no rigorous constraints are required for the functioning" (column 3 lines 48-49) is scientifically incorrect, and refers to the Gladwell reference which explicitly shows that the masses and springs of a vibrating structure are tied together in constraint

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

equations linking the values of one element (e.g., spring) to the desired resonant frequencies and mass elements.

From all the above reasons, it is submitted that the Frenk reference would not be considered by the skilled person, since it describes an inoperative system.

(ii) The references teach away from their combination

The skilled person reading through Elsner would understand that it is advantageous to achieve a wide range of mirror oscillation while using low energy for the actor element. The skilled person would also understand that he should reduce the motion of the actor elements to the minimum, namely to provide a non-resonant motion for the actor elements. Frenk teaches that all the elements should be moved in a resonant manner. This is Contrary to Elsner where the actor directly receives the supplied energy (by virtue of its electrical charge) so that a resonant motion of the actor is extremely undesired because the supplied energy cannot be kept at minimum in this way.

Thus, even if the skilled person had overlooked the inoperability of Frenk, he would still not consider combining it with Elsner, since Elsner teaches away from the combination.

(iii) Lack of factual information how to combine

Elsner is incapable of providing non-sinusoidal oscillation of the mirror. Elsner only has one resonant oscillator (the mirror element 7), because the actor elements (8, 9) are not resonant oscillators. As stated, Elsner teaches that the motion of the actor elements should be as little as possible to save on energy.

The combination suggested by the Examiner is to incorporate the teachings of Frenk into the device of Elsner. However, while the rejection explains why it would be obvious to incorporate the teachings of Frenk into the device of Elsner, the rejection does not explain which component of Frenk should be added to or substituted with which component of Elsner. Applicant submits that in view of the lack of clear explanation of the rejection, no *prima facie* case of obviousness was made.

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

There is nothing in Frenk's teaching that would explain the skilled person how to modify Elsner's device so as to allow oscillations according to non-sinusoidal waveform. It is submitted that the two references have totally different constructions and their combination is beyond the skill of the ordinary person. Elsner is based on non-resonant motion of the capacitors and a resonant motion of the mirror, while Frenk teaches intercalated oscillatory systems with individual natural frequencies that are in accordance with the Fourier analysis of the oscillatory motion to be synthesized. However, it is meaningless to apply Fourier analysis to Elsner, since Elsner has only one resonant oscillator, and therefore the Fourier "expansion" would have only one term, namely the frequency of the mirror itself. Thus, even if the skilled person were to consider Frenk he would therefore not be able to combine the references since the information regarding the combination is missing.

For clarity, Applicants are describing the teachings of Frenk and Elsner individually but are traversing the rejection with respect to the combination of these references, *infra*. That is, the Applicants are not attacking the references individually, rather addressing the combinations of references as set forth in the instant Office Action.

Support for the Amendment

The feature that the light processing module(s) and the additional masses form altogether a system of coupled oscillators characterized by n eigenvectors and n eigenvalues, is found, for example, in paragraphs 23 and 30.

The feature that the force producing element is configured for applying a periodic driving force characterized by a fundamental frequency ω_0 is found, for example, in paragraphs 43 and 49.

The feature that, for a given mass value of the light processing module, the mass values of the additional masses and the stiffness coefficients of the elastic elements, are selected such that each of the n eigenvalues is an integer multiplication

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

of ω_0 , is found in paragraph 37 (the specification defines eigenvalues as the natural frequencies of the coupled system, see paragraph 30 as a reference).

The feature that at least one of the eigenvectors corresponds to oscillation of the light processing module according to the specified geometric-waveform is found in paragraph 37 (the columns of the exemplified modal matrix ϕ are the eigenvectors ϕ_r , see also paragraph 30, as a reference).

Claim 3 has been amended for proper dependency.

The feature recited in new claim 18 is found in paragraph 20.

The feature recited in new claim 19 is found in Equations (11), (15) and (16).

No new matter was added.

In re Application of: Velger et al
Serial No.: 10/554,002
Filed: August 18, 2006
Office Action Mailing Date: December 6, 2010

Examiner: Tuyen Q Tra
Group Art Unit: 2873
Attorney Docket: 51381
Confirmation No.: 5153

Conclusion

In view of the above amendments and remarks it is respectfully submitted that the claims are now in condition for allowance. A prompt notice of allowance is respectfully and earnestly solicited.

Prior to mailing of the Examiner's next Official Action, the Examiner and his Supervisor are invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

/Jason H. Rosenblum/

Jason H. Rosenblum
Registration No. 56,437
Telephone: 718.246.8482

Date: June 6, 2010

Enclosures:

- Petition for Extension (3 Months)
- Declaration of Prof. Izhak BUCHER
- Curriculum Vitae of Prof. Izhak BUCHER
- Pages 57-98 of Daniel J. Inman, "Vibration with Control," 2006, John Wiley & Sons Ltd., ISBN 9780470010518, (Ref. [1] in the enclosed Declaration)
- Pages 63-92 in Gladwell, G.M, "Inverse Problems in Vibration," 2004, Springer, ISBN 9781402026706 (Ref. [2] in the enclosed Declaration)
- I. Bucher, "A Mechanical Fourier series Generator: An Exact Solution," 2009, Journal of Vibration and Acoustics, Transactions of the ASME, Volume 131, Issue 3, paper no. 031012 (Ref. [3] in the enclosed Declaration)